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ABSTRACT

Examined was the use of systematic observation techniques by cooperating teachers as a vehicle for improving the coordination of a secondary science teacher preparation program. This investigation involved 24 secondary science student teachers and their cooperating teachers. Self-instructional modules were used to instruct the cooperating teachers in the systematic collection and reporting of data. Each cooperating teacher collected data on one of the following teaching skills exhibited by his student teacher: preparation and use of lesson plans, preparation and use of performance objectives, and the intellectual levels of their classroom questions. In the treatment condition each student teacher was observed four times during the eight-week quarter. The data from each observation constituted the feedback. Using these data the student teachers evaluated their performance based on the model for teachers behavior. The feedback was effective in enhancing and maintaining the student teachers' level of performance on skills in lesson planning and using performance objectives. The effect of the feedback was differential and based on initial performance levels. Questioning skill was significantly affected. (Author/BR)

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Systematic Observation as a Technique for the Assessment and Improvement of Student Teachers' Competencies

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Preservice teacher preparation programs are most often conducted by two institutions — the public school and the university. Frequently, these institutions have different orientations. While the public school tends to focus on practicality the university concentrates on the theoretical. In addition to their philosophical differences, these two institutions are physically separate. This physical separation eliminates many possible interactions that could enhance meaningful communication. This problem is aggravated by the limited financial and personnel resources available to both parties.

In an effort to alleviate these difficulties several school/university cooperative models have been implemented.[1-3] The results of these efforts have been mixed. Clearly there is a need to establish effective lines of communication and methods of interaction which can lead to meaningfully integrated, school/university, teacher preparation programs.

Although it is well known that the cooperating teacher and his teaching style have dramatic effects on the development of student teacher attitudes and teaching styles,[4-9] systematic observation techniques have also been used effectively in the analysis and modification

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of student teacher behaviors. In recent efforts researchers have explored the effects of using systematic observation techniques in the preparation of teachers. Interpretation of these research findings permits the conclusion that training in the use of a systematic observation technique enables preservice and inservice teachers to improve their classroom performance along the dimensions of the systematic observation instrument used. 10-13, 15, 16 Thus, it appears that the use of these techniques may be an effective way to enhance school/university cooperation in a teacher preparation program and, concurrently, to improve the quality of the student teachers' instruction.

Purpose

The specific objectives of this study were to determine: (a) the effectiveness of minimal, self-instructional programs in preparing cooperating secondary science teachers to collect reliable data from systematic observation; (b) the effectiveness of feedback from systematic observation in modifying specific teaching behaviors of secondary science teachers, and; (c) the effects of using systematic observation techniques on the attitudes of secondary science student teachers and their cooperating teachers.

Treatment Groups

Six treatment groups were established in this study (Fig. 1). These include three groups of secondary school science cooperating teachers (N=24) and the student teachers assigned to them (N=24). The cooperating teachers were employed in public schools in various cities in Indiana. During their secondary science methods course the student

teachers received instruction in: (a) the interpretation of systematic observation data on their own microteaching lessons, and; (b) models of appropriate teacher behavior with respect to objectives, lesson planning, and questioning. Similarly, through the completion of self-instructional modules (to be described below) the cooperating teachers were instructed in the collection and recording of data via the systematic observation of their student teachers. The distinction between the three treatment groups of cooperating teachers lies in the nature of the data that they were instructed to collect. The first group collected data on their student teachers' preparation and use of lesson plans. The second group collected data on the preparation and use of performance objectives and the third on the intellectual levels of the student teachers' questions.

These data were presented as feedback to the student teachers on four occasions during the 8-week student teaching quarter. Each of the three treatment groups of student teachers received feedback on the skill that their cooperating teacher was trained to observe. The cooperating teachers were instructed to help the student teachers interpret the data and encourage them to self-evaluate their performance. This feedback constituted the experimental treatment for this study.

In addition, a semantic differential instrument was used to assess changes in the student teachers' and the cooperating teachers' attitudes toward systematic observation. Attitude data were collected prior to and following the experimental treatment.

Non-Equivalent Control Groups

Due to the limited number of student teachers available for this study, three non-equivalent control groups were established. The control and treatment groups were non-equivalent in that control data were collected for only the fourth observation conducted by the cooperating teachers. Each student teacher in the study served as a member of a treatment group and a control group. That is, the student teachers in one treatment group served as control subjects for another treatment group.

For example, each cooperating teacher in the lesson plan treatment group collected and recorded data from four observations of his student teacher's lesson planning behavior. Data on the lesson planning behavior of student teachers in the questioning and performance objectives treatment groups were collected only for the fourth classroom observation. These data constituted control group data for the lesson planning treatment group. Control groups for the questioning and performance objectives treatment groups were established in an analagous manner.

The Systematic Observation Modules and Data Forms

Three Systematic Observation Modules were used as self-instructional materials for the cooperating teachers in this study. (Copies of these modules are available from the Science Education Center, Indiana University, Bloomington, Indiana). Each of the following modules was adapted for use in this study by the researcher and designed to instruct the cooperating teachers in the collection and recording of

systematic observation data on a specific teaching skill:

(1) The Systematic Observation Module on Performance Objectives consists of a filmstrip and audio-taped presentation plus written instruction. It is designed to instruct the cooperating teacher in the evaluation of: (a) the mechanical correctness of written performance objectives, and; (b) the student teacher's use of performance objectives. Evaluation of the mechanical correctness of an objective was based on its containing an appropriately stated testing situation, a performance term(s), and a qualifying or criterion term(s). The appropriate 'use' of a performance objective is defined by two criteria: (a) making the students aware, at least in a general sense, of the objectives for the lesson, and; (b) the structuring of questions and organization of activities that will lead to student attainment of the objectives. Data on the mechanical correctness and use of objectives were recorded on the data form accompanying the module.

(2) The Systematic Observation Module on The Intellectual Level of Teacher Questions consists of a filmstrip and audio-taped presentation plus written instruction. It is designed to instruct the cooperating teacher in classifying the student teacher's classroom questions according to the six levels of Bloom's Taxonomy[18] plus one category for non-cognitive questions. The simple percentages of questions asked in each of the seven categories were recorded on the corresponding data form.

The percentages are based on the total number of questions asked in the twenty minute class segment immediately following the first ten minutes of a class period.

(3) The Systematic Observation Module on Lesson Plans is a written program designed to instruct the cooperating teacher in the evaluation of the student teacher's lesson plan. The lesson planning criteria are derived from Gange's nine events of instruction.[19] These data were recorded in the form of checklists of criteria for the student teacher's written lesson plan and his implementation of that plan in the classroom.

Treatments

There were two treatment groups and six treatments administered in this study. The cooperating teacher group received instruction in the collection and recording of systematic observation data via the self-instructional systematic observation modules which were distributed by the researcher. After completing this instruction they collected data on four lessons taught by their student teachers. Following each observation these data were presented as feedback to the student teachers. Thus, completion of the self-instructional program and use of systematic observation techniques with the student teacher constituted the experimental treatment for the cooperating teacher group.

The student teachers received feedback on their classroom performance of specific teaching skills. Feedback was received following each of four observations conducted a minimum of one week apart. The feedback was in the form of data collected by the cooperating teachers and recorded on the Systematic Observation Data Forms. The cooperating

teachers could assist in the interpretation of the data but were instructed not to make evaluative judgments concerning the student teachers' performance of the skill observed. The student teachers were instructed to self-evaluate their performance and make any adjustments in their teaching which they deemed necessary. It was assumed that their self-evaluations would be guided by the model for teacher behavior provided in science methods. This feedback constituted the experimental treatment for the student teacher group.

Results

The following analysis is organized around three basic issues: (a) the ability of the cooperating teachers to collect reliable systematic observation data, (b) the effects of feedback on the performance of the student teachers with respect to lesson plans, performance objectives, and questions, and (c) the attitudes of the cooperating teachers and the student teachers toward systematic observation.

Effectiveness of the Systematic Observation Modules — This effectiveness was determined by two measures. The first measure consists of scores on the self-tests contained within the modules. The established level of mastery (80%) for the three instructional modules was attained by 72% of the cooperating teachers. A second measure was obtained by determining the reliability of the observation data collected by the cooperating teachers. To accomplish this an additional coder was instructed using the three systematic observation modules.

The coder randomly and blindly coded eight sets of data from each of the three experimental groups and all the data from the control groups. Simple percent agreement between the trained coder and the cooperating teachers was calculated to be 82% for the performance objectives group, 71% for the lesson planning group, and 57% for the question-level group.

The Student Teachers' Preparation and Use of Lesson Plans and Performance Objectives — Four sets of analyses were performed in order to determine the effects of the feedback from systematic observation on the student teachers' preparation and use: (a) lesson plans, and (b) performance objectives. The analyses of the data for these two treatment groups were analogous and are discussed below. The significant results are summarized in tables 1 and 2.

First, correlated t tests were used to compare scores (recorded on the data forms) for the first and fourth observations. No significant differences were found in either treatment group.

Second, trends in the scores over four observations were examined via analysis of variance. Although the means generally increased for both groups the trends were not significant. Following subsequent examination of scores for individuals, two subgroups were identified — one with low initial scores and one with high initial scores. The means of these subgroups were graphed (Figures 2, 3, 4, and 5). A two-way analysis of variance for repeated measures was used between the two subgroups within each treatment group. These results were significant for the written lesson plan group and the written performance objectives group. Significant differences were located using Scheffe's S Method

of comparison. The differences between the subgroup means for the first observation were found to be significant in both treatment groups.

Third, t tests were used to compare the fourth observation scores of each experimental group with the score of its control group. The difference for the written performance objectives scores was significant.

Fourth, the correlation between the preparation and implementation scores for these two treatment groups was determined using Pearson Product Moment Correlation Coefficients. The correlation between the written lesson plan scores and the lesson plan implementation scores was found to be significant. Finally, an analysis of variance with simple main effects was used to examine differences between preparation and implementation scores at each observation and overall. These results were significant for the overall comparison within the lesson plan treatment group. Within this treatment group the F values showed a consistent decrease from observation one through observation four. No other significant F values or consistent F patterns were found.

The Intellectual Levels of the Student Teachers' Questions — Three sets of analyses were performed to determine the effects of feedback from systematic observation on the intellectual levels of the student teachers' classroom questions. First, the results of a correlated t test between the percentages of knowledge level questions asked during the first and fourth observations were not significant. Similar results were obtained for comparisons of percentages of knowledge plus comprehension level questions and questions above the comprehension level.

Second, examination of the trends in percentages of questions asked at each level over the four observations revealed that the trends fell into three distinct sets (Figure 6). The mean percentage of knowledge level questions remained relatively high. Furthermore, the percentages in all three sets were maintained consistently.

Third, using a t test a comparison was made between the percentages of questions asked by the student teachers during the fourth observation and the control group. No significant differences were found at the knowledge, comprehension, or, non-cognitive levels. The comparison of above comprehension level questions yielded a t-value of 1.87 which had a probability of 0.072.

Attitude Toward Systematic Observation — The attitudes of the student teachers and the cooperating teachers toward the concept of systematic observation were measured in a pretest - posttest manner using a semantic differential instrument. Numerous comparisons of scores on this instrument were made in an attempt to identify attitudinal differences. These comparisons were: student teachers' pretest vs. posttest; cooperating teachers' pretest vs. posttest; posttest scores of the three student teacher experimental groups; posttest scores of the three cooperating teacher experimental groups; student teachers' vs. cooperating teachers' pretest scores, and; student teachers' vs. cooperating teachers' posttest scores. Statistically significant differences ($t=3.12$, $p=0.007$) were found only for the student teachers' pretest vs. posttest attitude scores. These attitude scores became less positive. Through written and verbal communication between the student teachers

and the researcher it became evident that in spite of the researcher's efforts in communication the student teachers misperceived the purpose of the study. Unfortunately they interpreted the collection of systematic observation data as an attempt at total evaluation of their teaching efforts. This was neither the intention · practice of the researcher.

Conclusions

An analysis of the findings from this study permits the following conclusions:

(1) student teachers in the treatment groups showed consistent improvement in their preparation and use of performance objectives and lesson plans,

(2) all four subgroups of student teachers in the lesson plan and performance objectives treatment groups who had low initial performance scores improved their performance and for two subgroups this improvement was significant,

(3) student teachers in the lesson plan and performance objectives treatment groups who had high initial scores maintained that performance level,

(4) student teachers in the lesson plan and performance objectives treatment groups consistently out-performed the control group subjects,

(5) the percentages of questions at the various intellectual levels used by the student teachers in the question-asking treatment group remained constant,

(6) the attitudes of the student teachers toward systematic observation became significantly less positive while the attitudes of the coop-

erating teachers showed moderate improvement,

(7) the cooperating teachers rated their student teachers' implementation of lesson plans and performance objectives higher than their preparation,

(8) there was a very high positive correlation between the quality of the student teachers' written lesson plans and their implementation of those plans.

Discussion

The results of this study provide evidence that concise, self-instructional materials containing a minimum of instruction can be effective in preparing cooperating teachers to collect and report data from systematic observation.

When student teachers receive and use these data for purposes of self-evaluation the consequences are varied and often positive. In particular a differential effect appears which is relative to the initial performance level. The feedback helps the student teacher with low initial performance to analyze his behavior and improve his performance. For the student teachers showing high initial performance this feedback appears to assist in the maintenance of a high performance level. Overall it appears that student teachers used this feedback for self-improvement. Furthermore, they did this despite an increasingly negative attitude which developed from an unfortunate misconception.

The absence of these beneficial effects in the intellectual levels of questions used by the student teachers may be a result of a less effective instructional program, an abnormally high initial questioning level, and

the fact that the questioning skill is more complex and/or less amenable to influence than the other skills examined.

Thus, at a time when teacher competencies are under close scrutiny the search for more effective preservice teacher education strategies is highlighted. Feedback from systematic observation can foster the development of teaching skills by making student teachers more aware of their teaching behavior.

Synopsis

In this study the researcher examined the use of systematic observation techniques by cooperating teachers as a vehicle for improving the coordination of a secondary science teacher preparation program. This investigation involved 24 secondary science student teachers and their cooperating teachers. Self-instructional modules were used to instruct the cooperating teachers in the systematic collection and reporting of data. Each cooperating teacher collected data on one of the following teaching skillsexhibited by his student teacher: preparation and use of lesson plans, preparation and use of performance objectives, and the intellectual levels of their classroom questions.

In the treatment condition each student teacher was observed four times during the eight week quarter. The data from each observation constituted the feedback. Using these data the student teachers self-evaluated their performance based on the model for teacher behavior which they were presented in methods instruction.

The feedback was effective in enhancing and maintaining the student teachers' level of performance on skills in lesson planning and using

performance objectives. The effect of the feedback is differential and based on initial performance levels. The questioning skill was not significantly affected.

TABLE 1

Summary of Results for the Lesson Plan Treatment Group

Statistical Procedure	Lesson Plan Group(s)	Test Statistic	Probability
2-Way Analysis of Variance for Repeated Measures	Written - 2 subgroups	F=23.9	p=0.002*
Scheffé's S Method	Written - Obs. 1 2 subgroups	F=52.12	p<0.000**
t Test	Written - Observation 4 vs. Control Group	t=2.03	p=0.062
Pearson Product Moment Correlation Coefficient	Written with Implementation	r=0.60	p<0.000**
Analysis of Variance with Simple Main Effects	Written with Implementation - overall	F=6.86	p<0.05*

* p < .05 = Significance Level
**Highly Significant

TABLE 2

Summary of Results for the Performance Objectives Treatment Group

Statistical Procedure	Performance Objectives Group(s)	Test Statistic	Probability
2-Way Analysis of Variance for Repeated Measures	Written - 2 subgroups	F=9.9	p=0.0196*
Scheffé's S Method	Written - Obs. 1 2 subgroups	F=79.91	p<0.000**
t Test	Written - Observation 4 vs. Control Group	t=8.63	p<0.000**
t Test	Implementation - Observation 4 vs. Control Group	t=1.89	p=0.080
Pearson Product Moment Correlation Coefficient	Written with Implementation	r=0.30	p=0.093

* p< .05 = Significance Level
**Highly Significant

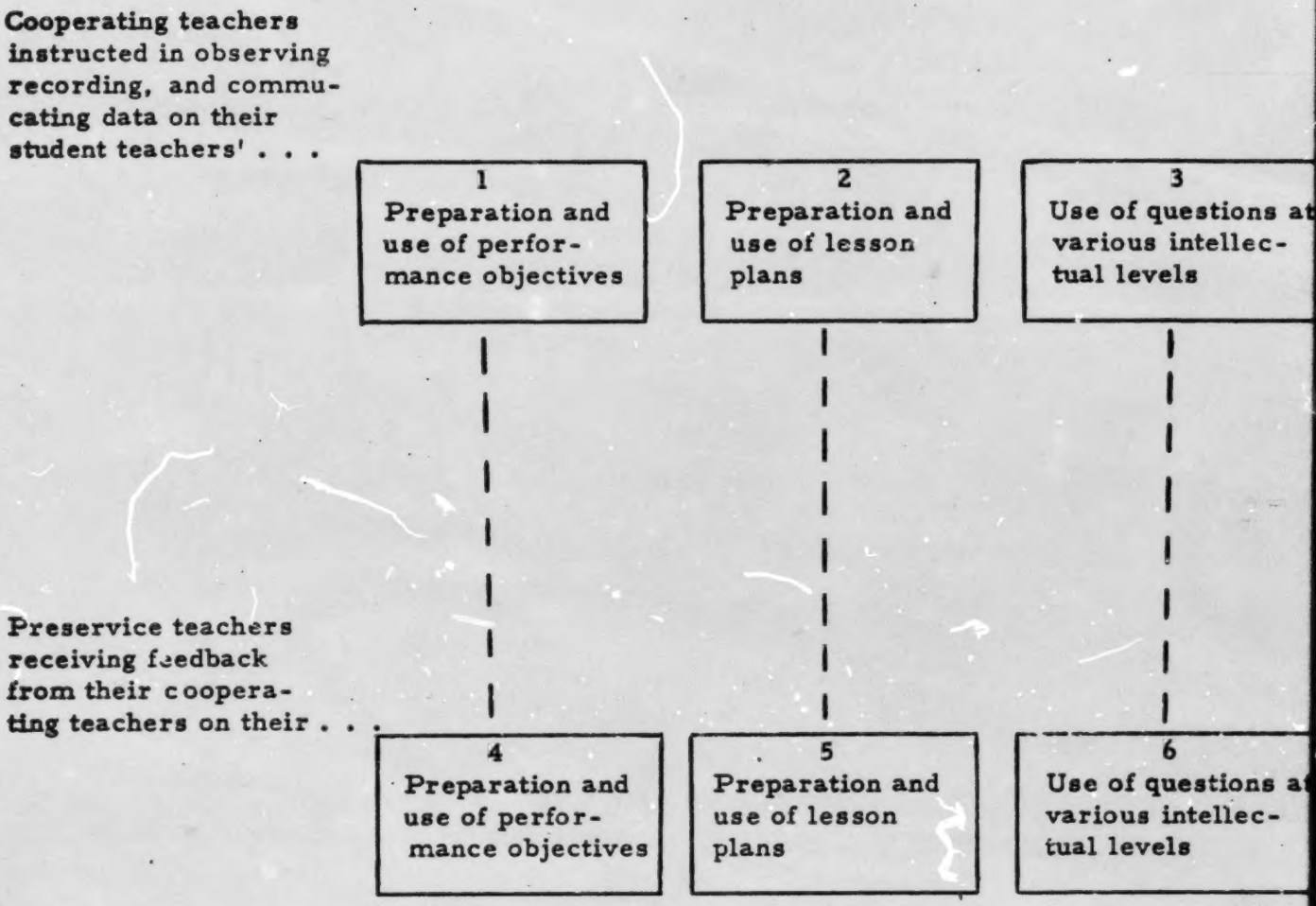
Cooperating teachers instructed in observing recording, and commucating data on their student teachers' . . .
1
Preparation and use of performance objectives
2
Preparation and use of lesson plans
3
Use of questions at various intellectual levels
Preservice teachers receiving feedback from their cooperating teachers on their . . .
4
Preparation and use of performance objectives
5
Preparation and use of lesson plans
6
Use of questions at various intellectual levels

Fig. 1. The six treatment groups of this study

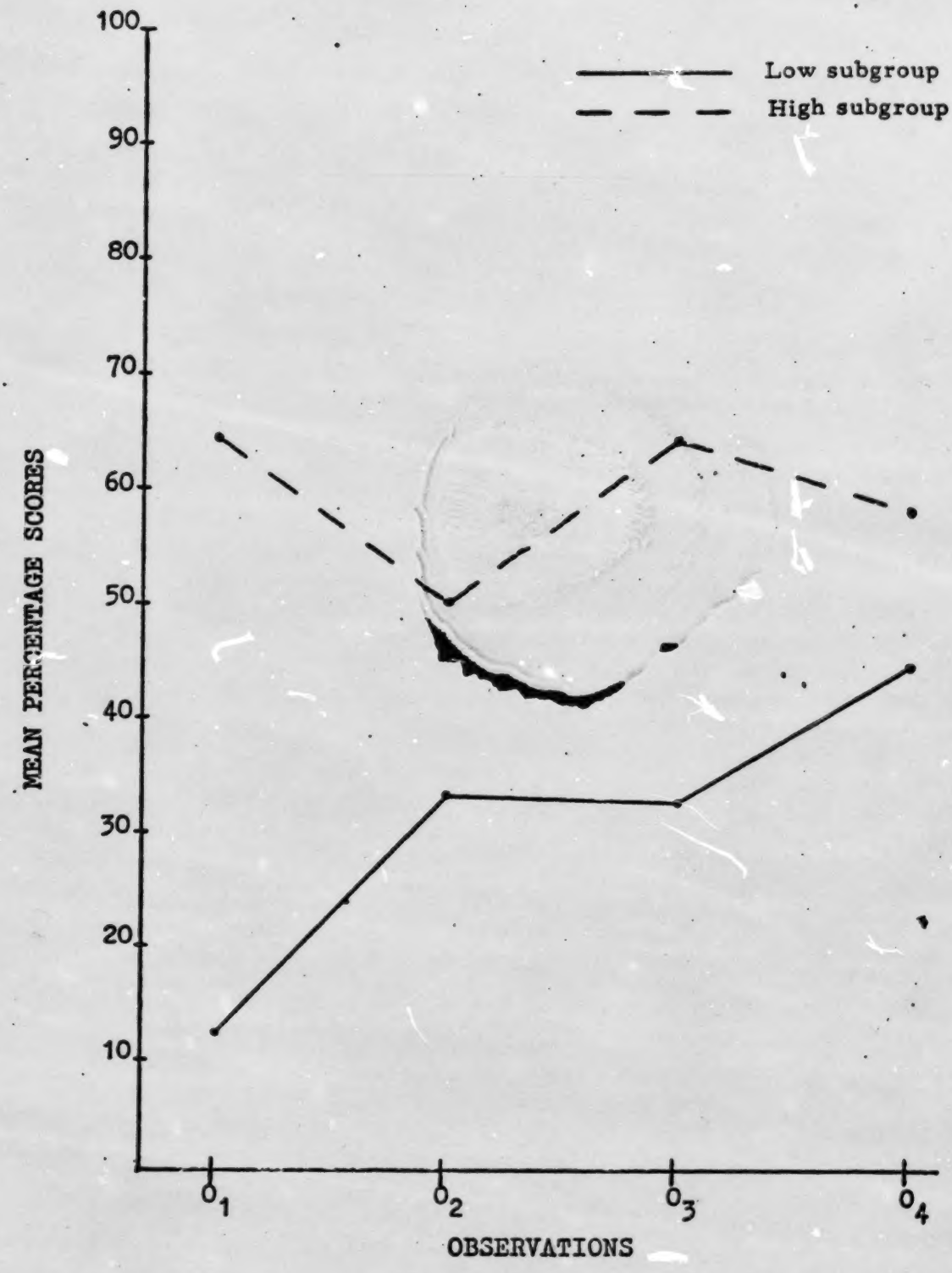

Fig. 2. Mean percentage scores for the student teachers' written lesson plans — low and high subgroups.

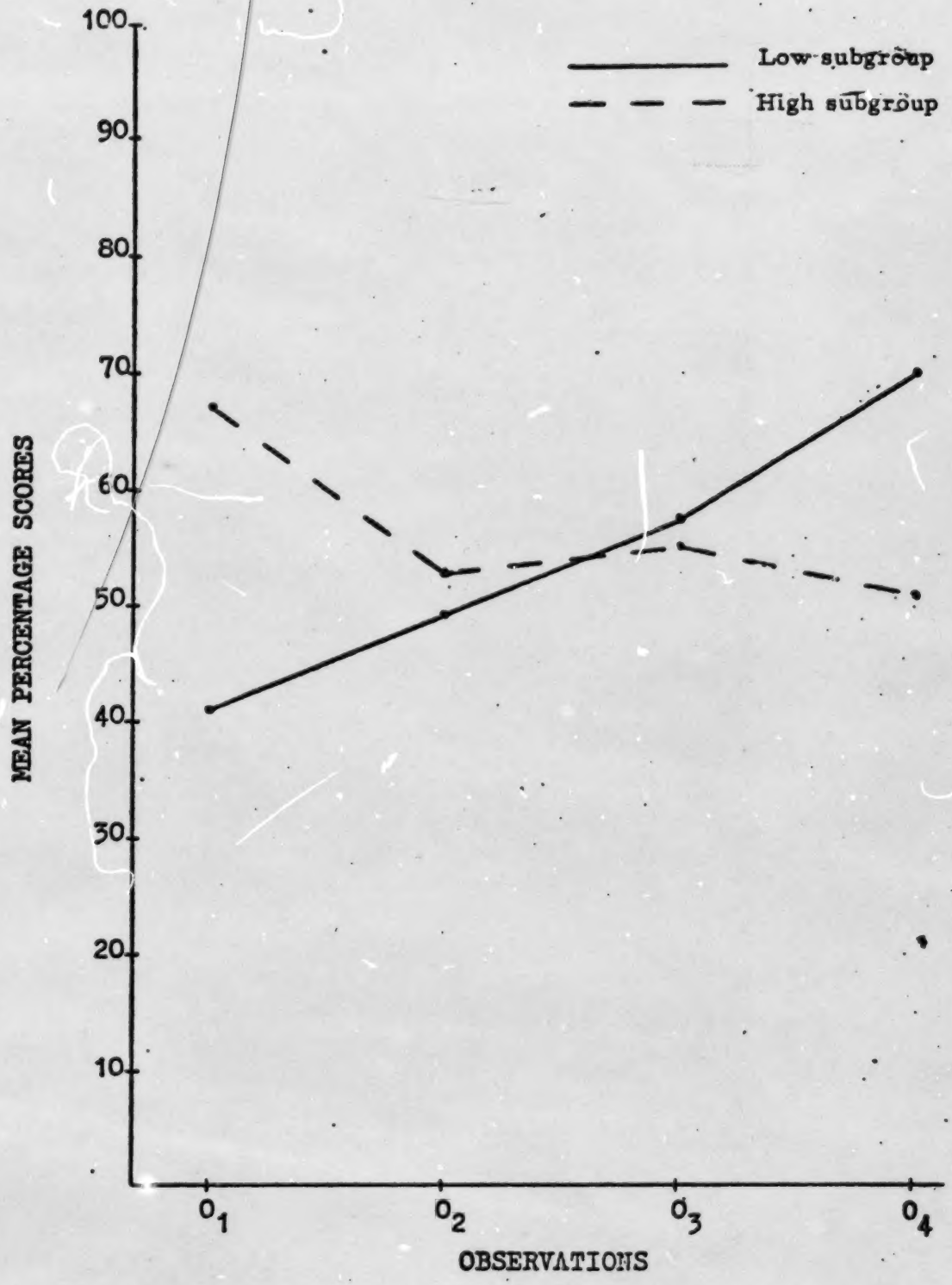

Fig. 3. Mean percentage scores for the student teachers' implementation of lesson plans — low and high subgroups.

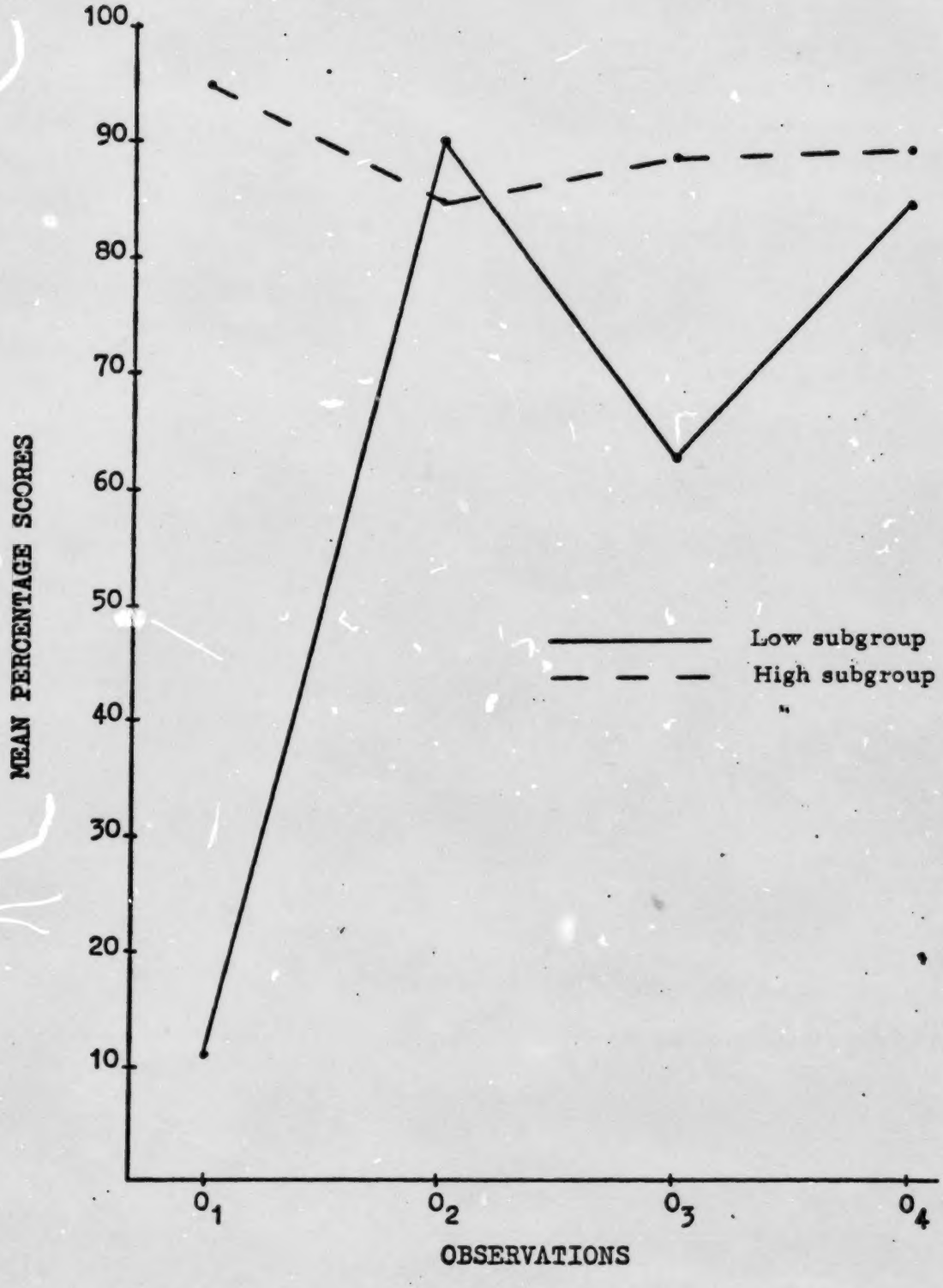

Fig. 4. Mean percentage scores for the student teachers' written performance objectives — low and high subgroups.

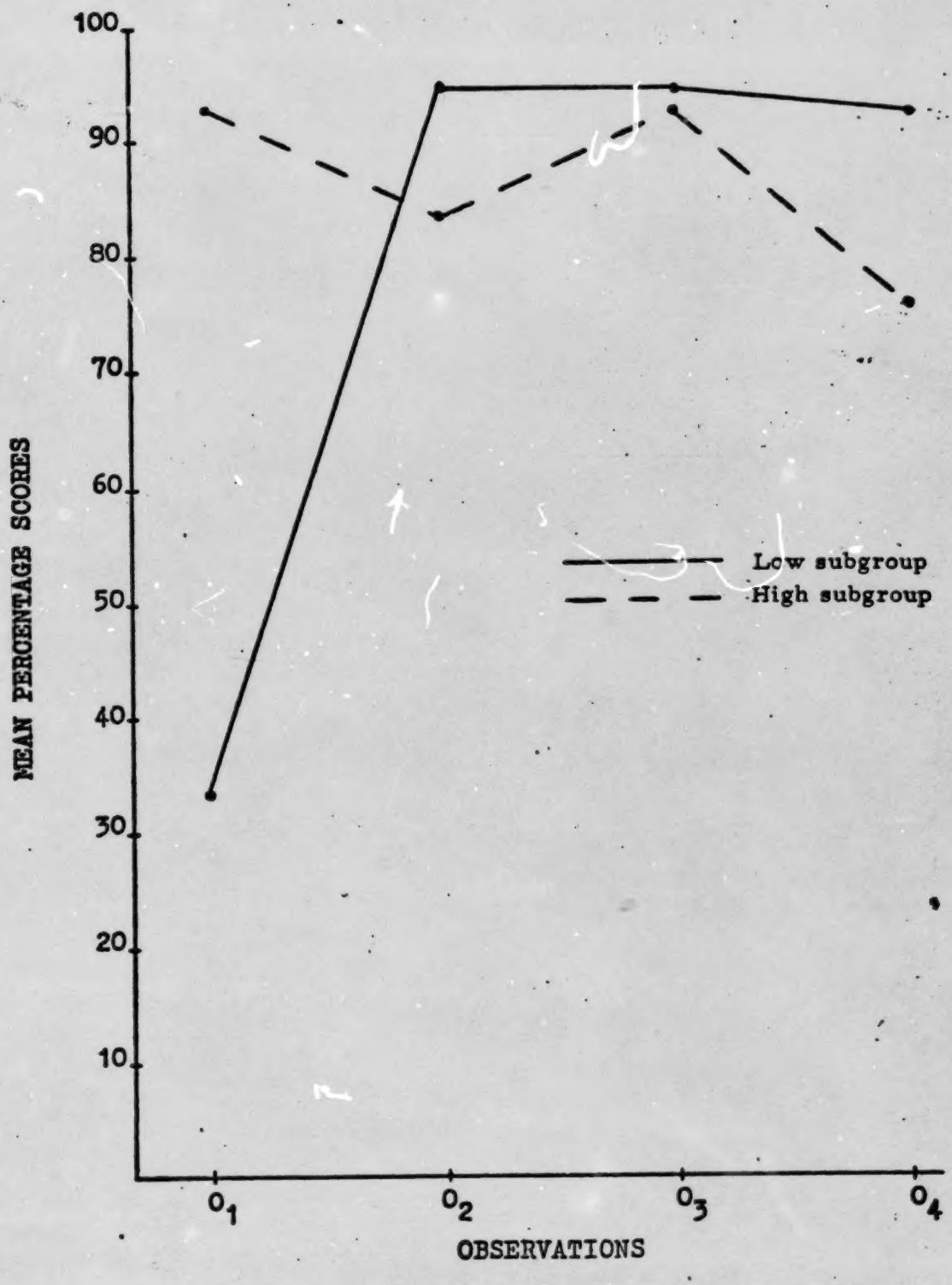

Fig. 5. Mean percentage scores for the student teachers' implementation of performance objectives — low and high subgroups.

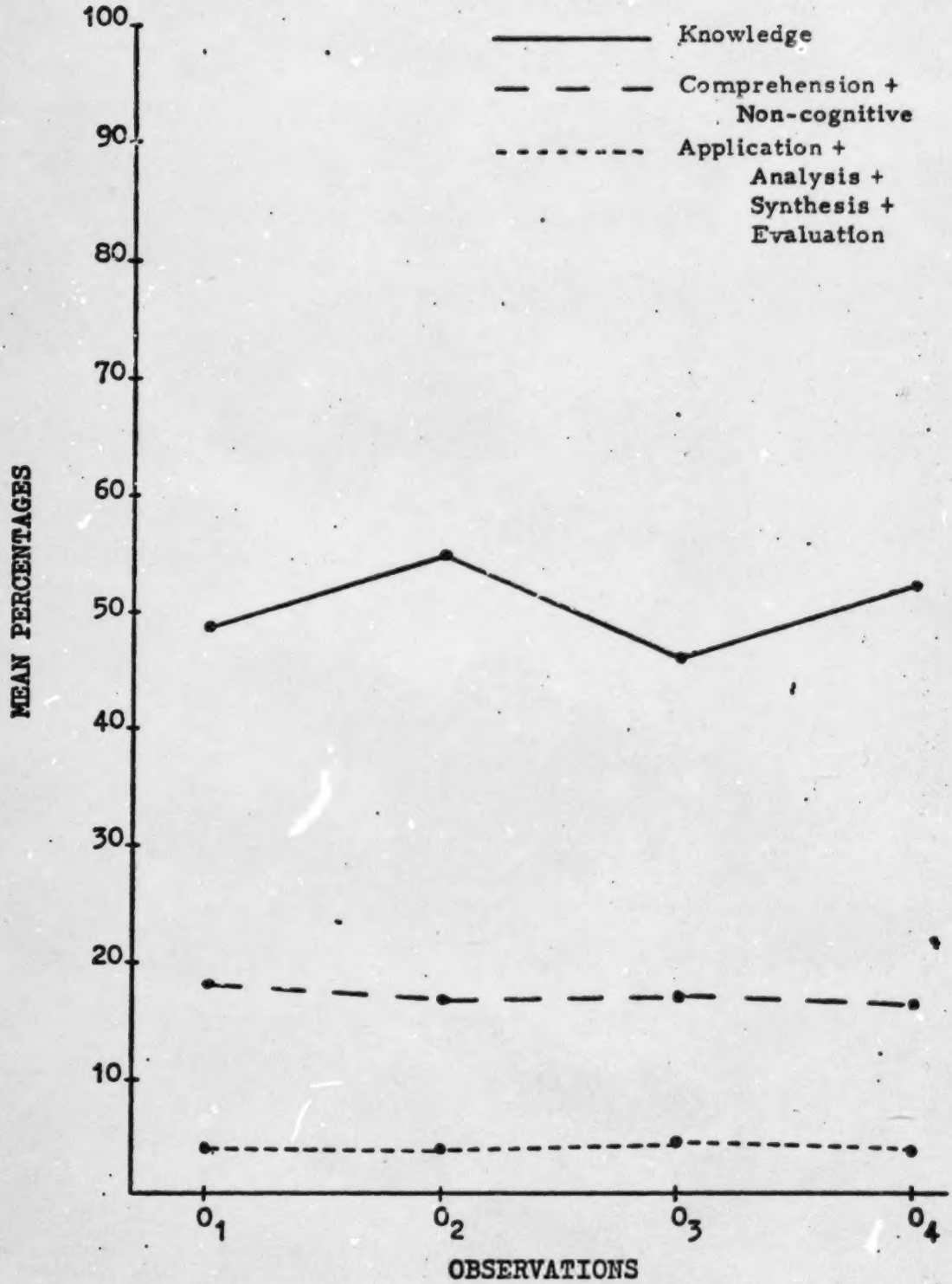

Fig. 6. Mean percentages of the student teachers' questions at the various intellectual level.

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